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AUTHOR Nathan, Barry R.
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ABSTRACT

While most organizations rely on cutting scores to screen job applicants, little research and few accepted methods exist to help practitioners identify cutting scores that will be job-related. This paper describes how the Work Keys system job analysis process was used to provide job-related, content-valid cutting scores. Using job analysis results from two office jobs and two production jobs, and assessment data from 53,378 high school students predominantly enrolled in vocational and technical programs as an estimate of the applicant workforce, the Work Keys system identified pools of qualified applicants for subsequent selection. Depending on the jobs, Work Keys eliminates or reduces the adverse impact against protected minority groups. (Contains six tables and seven references.) (Author/SLD)

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"Tests Great, Less Filing":

Reducing Adverse Impact Through Job Analysis

Barry R. Nathan

ACT Center for Education and Work

Paper presented at the Annual Meeting of the International Personnel Management Association Assessment Council, June 28, 1995, New Orleans, LA.

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Abstract

While most organizations rely on cutting scores to screen job applicants, little research and few accepted methods exist to help practioners identify cutting scores that will be job-related. This paper describes how the Work Keys system job analysis process was used to provide job-related, content-valid cutting scores. Using job analysis results from two office jobs and two production jobs, and assessment data from 53,378 high school students predominantly enrolled in vocational and technical programs an estimate of the applicant workforce, the Work Keys system identifies pools of qualified applicants for subsequent selection, while depending on the jobs, eliminates or reduces the adverse impact against protected minority groups.

"Tests Great, Less Filing": Reducing Adverse Impact Through Job Analysis

One of the most vexing challenges of employment testing is that of setting cutting scores. Standards of professional practice, such as the *Standards for Education and Psychological Testing* (American Educational Research Association, 1985) and *The Principles for the Validation and Use of Personnel Selection Procedures* (Society for Industrial and Organizational Psychology, 1987), provide general guidelines, but do not make specific recommendations or procedures for setting cutting scores (Cascio, Alexander, and Barrett, 1988). As noted by Berk (1986), the process "remains controversial to discuss, difficult to execute, and almost impossible to defend" (p.137).

Further complicating the process of setting an accurate cutting scores is the possible adverse impact that cutting scores could have on groups protected under Title VII of the Civil Rights Act. Cascio, et al. (1988) reviewed the administrative, constitutional, and statutory laws related to setting cutting scores and concluded that there does not appear to be a "single, mechanical, quantitative approach that is accepted or required by the courts" (p.8), nor is there agreement that a cutting score must be validated. Rather, to quote the *Uniform Guidelines on Employee Selection Procedures*, a cutting score "should normally be set so as to be reasonable and consistent with the expectations of acceptable proficiency within the work force" (29 C.F.R. Section 1607.F (H), 1984).

Most organizations rely on cutting scores because they are simple to use or because they to help provide reasonably large applicant pools that support affirmative action initiatives. Therefore, considerably more attention to cutting score value and utility is needed. The purpose of this study was to describe a procedure which provides job-related, content-valid cutting scores, and how this process can reduce adverse impact.

Job Profiling Component of the Work Keys System

Surprisingly, most job analysis systems do not provide information about the level of skill necessary to perform a task or job effectively (Cascio, et.al. 1988). One exception is the job profiling procedure used in the Work Keys system developed by American Collge Testing (ACT). Work Keys is an integrated system for documenting and improving the nation's generic employability skills (i.e., those skills crucial to effective performance in most jobs). This multifunctional information system has four interactive components: assessment, job profiling (job analysis), instructional support, and reporting. The system uses a common metric, (i.e., the same scale) to measure an individual's levels of skills and the levels of skills needed on the job. Such a metric makes it possible for employers to determine the qualifications of potential employees and to design job-training programs that will help current employees meet the demands of tomorrow's jobs, as well as guide educators/instructors as they tailor instruction to better prepare learners for the workplace. (More comprehensive descriptions of the Work Keys system can be found in Nathan, McLarty, & West, 1994; Palmer & Hane, 1995.)

The Work Keys System job profiling procedure provides accurate profiles of skills through a systematic task analysis, most important task selection process, followed by a skill analysis that identifies the skills and *levels of skills* required to perform effectively on the job. To profile a job, the job analyst first obtains background information about the organization and about how the job fits within the work environment of that company. Using this research, the analyst begins the process of task analysis. First, the analyst consults the *Dictionary of Occupational Titles* to develop a task list comprising the tasks most relevant to

the job being profiled. Then the analyst meets with subject matter experts (SMEs), incumbents in the job being profiled, from the organization, who may add, delete, consolidate, and/or change the descriptions of the tasks to make sure they accurately depict the job as it is performed in their company.

After carefully examining this list of tasks, the SMEs rate the job tasks according to two dimensions, Importance and Relative Time Spent. The ratings are multiplied together to obtain a Criticality rating, and then rank ordered according to their Criticality ratings. Finally, the SMEs review the rank ordering, remove the least important tasks, and make any necessary revisions to those tasks remaining.

Once the tasks most critical to job performance are indentified, the SMEs begin the process of skills analysis. During this process, the SMEs identify the tasks associated with each Work Keys skill and determine the Work Keys skill levels required to perform the job. The analyst presents detailed descriptions of each of the Work Keys skills to the SMEs. These descriptions include examples of problems or situations employees must deal with at each level. The SMEs decide as a group which of the Work Keys skill areas are relevant to the job and the skill levels necessary for effective performance in their job. The final product of this profiling process is a document listing the most important tasks an individual in that job must perform and, for each relevant skill area, the skill level required on the job.

The skill level derived from the job analysis is analogous to the *critical score* described in both the *Standards* and in the *Principles* as the score below which an applicant would not be expected to be successful on the job. (In contrast, a *cutting score* is the score below which applicants are rejected, but which may depend on economic or social concerns, as well as minimum competency.)

Cutting Scores and Adverse Impact

A concern among users of cognitive ability tests is the consistent finding that average test scores differ across race and ethnic groups. For example, on average, samples of African-Americans score between one-half and one standard deviation below samples of White/Caucasians. When used as part of a selection or screening procedure, *adverse impact* effects of cognitive tests are identified. Most top-down selection or screening practices will result in considerable adverse impact as, proportionally, fewer protected minority group members have higher scores compared to the nonprotected group members, and therefore, fewer are available for subsequent consideration for jobs in the organization.

The EEOC considers adverse impact as evidence of discrimination. However, if an employer can show that the selection device is job-related despite its adverse impact, the EEOC will allow the continued use of that selection device. Demonstration of a test's validity to select qualified employees is the typical measure of a test's job-relatedness. This has often led to a popular misconception that there are valid tests and invalid tests, or that valid tests do not have adverse impact. In reality, however, all competently developed cognitive ability tests are valid (see, for example, validity generalization results) and also have adverse impact. Regardless, even the used assessment information obtained from valid tests needs some basis for setting cutoff scores.

A common technique for reducing the adverse impact of cognitive ability tests is to lower the cutoff scores so that a sufficient number of minorities "pass" the test and can be considered for subsequent consideration for hiring or promotion. However, this can inadvertently lower the overall quality of the organization's work force as less qualified applicants (irrespective of racial or ethnic identity) are included in the applicant pool.

As noted above, there is little guidance for setting cutoff scores that will ensure that applicants have the necessary level of skill to be effective on the job. The current study looks at the effect of using job analysis-based critical scores for three assessments with heavy cognitive loads. It also highlight's the advantage of setting job analysis-based critical scores to reduce adverse impact and to support an organization's affirmative action programs.

Method

Work Force Sample

Data used in this study are from 53,378 high school students enrolled predominantly in vocational and technical education programs collected in two states using the Work Keys system. These students in several states take Work Keys assessments as part of state programs to evaluate and update state educational systems. The data do not represent the cognitive ability of all high school students in a state (or the nation), since other students, particularly those considering college in their immediate future, take the ACT Assessment or SAT. However, the data do represent the cognitive skill levels of a significant proportion of a state's near-future work force. More importantly, they represent the skill levels of the future work force who will be applying for jobs that while requiring some postsecondary education/training, do not require a college degree.

Assessments

Data from three Work Keys assessments were used in this study: *Reading for Information, Applied Mathematics,* and *Locating Information* (reading and interpreting graphic material presented in tables, spreadsheets, graphs, maps, schedules, etc.). These three assessments are most easily comparable in content to traditional cognitive achievement and ability tests and, therefore, like other tests with similar content, would be expected to have

comparable levels of adverse impact. However, though the content is comparable, Work Keys assessments are quite different in their choice of items, in their structure, and in their scaling methodology.

All items in the Work Keys assessments are taken from workplace situations and are applicable, as opposed to theoretical, in nature; that is, they require practical problem-solving skills. In addition, when developing the assessments, it was decided (with advice from experts in the fields of business and education) to pursue a criterion-referenced approach rather than norm-referenced (Hambleton & Rogers, 1990). This decision is related to the purpose of the Work Keys system; Work Keys is designed as a system that can be used to document and improve the skills of the work force. Such a system should be able to identify what a person can do and what he or she can do improve his or her skills. That is, an examinee's performance on the assessments is compared to an established scale or standard (e.g., the proficiency level of a skill required for successful completion of a training program), rather than against the test performance of others standardized along a normal distribution.

ACT also wanted the assessment scores to reflect the hierarchical nature of each skill. Because of this unique combination of needs, it was decided that the Work Keys skill scale should be Guttman-based. A Guttman scale orders items in such a manner that an examinee scoring at a given point on the scale will have responded correctly to items less difficult than those at that point and incorrectly to items more difficult than those at that point. This establishes a rank order of individuals with respect to the construct being measured (Guttman, 1950), and also reflects each individual's proficiency in the construct (i.e., skill area).

Accordingly, a Work Keys skill assessment is conceived as a series of item pools, one pool for each level of the assessment. The items within each level are relatively

homogeneous with respect to the skills assessed and their difficulty. Also, the items at each level assume and build on the skills assessed at lower levels.

Sample of Jobs

A job profile results from a job analysis of a specific job from a specific company or facility. Each profile reflects the levels of skills needed for an employee entering the job to be successful. The profiles are obtained by ACT-trained and ACT-authorized job profilers, either industrial psychologists employed by ACT or individuals who participated in a week-long job profiling training program.

As of June 19, 1995, ACT had 483 job profiles in its database. Each profile includes from two to seven skills because of when the profile was collected (some profiles were collected when only four skills were available) or because of special requests by an individual employer. Four jobs are included in this study: two clerical jobs, shipping/receiving clerk and secretary; and two factory production jobs, production assembler and numerical control (NC) machine operator.

Adverse Impact Analyses

Assessment data were analyzed for each of the three skills areas into four racial or ethnic groups: White/Caucasian, African-American groups, Hispanic, and Asian (categories were examinee-reported). For each skill, the cumulative percentages of individuals meeting or exceeding each level of skill is reported. Finally, relative adverse impact at each level of skill is reported. Adverse impact was calculated using a variation of the 80% Rule; that is, whether the percentage of each protected group at or exceeding the skill level is within 80% of that for the White/Caucasian sample taking the Work Keys assessments.

Results

Data are reported for each skill area separately. Tables 1 - 3 show that, proportionately, a lower percentage of these samples of African-Americans and, in general, Hispanics successfully mastered higher levels of skills compared to the percentages of White/Caucasians and Asians. This is consistent with results of other validated cognitive ability tests of comparable skills. However, percentages become more similar at lower and middle levels of each skill, suggesting that for jobs that do not *require* higher skill levels, no adverse impact was apparent. For example, there was no adverse impact on African-Americans at Levels 3 or 4 of *Reading for Information* or of *Locating Information*, nor evidence of adverse impact against African-Americans at Level 3 of *Applied Mathematics*.

For Hispanics, there was no adverse impact at Levels 3, 4, or 5 of *Reading for Information*, or Levels 3 or 4 of *Locating Information*. For *Applied Mathematics*, the results are more complicated. In one state, no adverse impact was found at Levels 3, 4, or 5 of the skill; in another state, no adverse impact was found at Levels 3 or 4 of *Applied Mathematics*. Because the overall sample size is small for Hispanics, the number of Hispanics performing at the higher levels is substantially reduced, and the extent of adverse impact results should be interpreted cautiously. Still, it is interesting to note that the percentage of Hispanics performing at Level 7 of *Reading for Information* is actually higher than that for White/Caucasians, though the reverse is true at Level 6.

No adverse impact against Asians was found in either sample for any of the skills or levels of skills, with the possible exception of Level 7 of *Reading for Information*, where again, because the sample size is small, the analysis must be interpreted cautiously.

The ranges and medians of profiles for the two clerical and two production jobs are presented in Table 4. Using the median values for each job as the cutting score, there is no

expected adverse impact against any group where the Work Keys assessments would be used for selecting persons into either the clerk or assembler jobs, despite the fact that both jobs require some level of each of the cognitive skills. For the two jobs requiring higher levels of skills, secretary and NC machine operator, some adverse impact still exists. Actual results would vary depending on each organization's jobs and resulting profiles, and the distribution of skills in each organization's actual applicant pool.

Discussion

As discussed above, despite the widespread use of cutting scores for screening decisions, little research exists to guide practitioners on how to set cutting scores for content-valid tests. This study described a procedure that provides job-related, content-valid cutting scores and demonstrated how this process can reduce adverse impact.

By determining what are in effect, necessary levels of cognitive skills for jobs, the procedure can accurately identify pools of qualified applicants for subsequent selection. The process has the potential to eliminate adverse impact of tests for some jobs where lower levels of cognitive skills are required, and reducing it at higher skill levels. By identifying pools of qualified applicants instead of using top-down lists of job candidates, employers are free to make selection decisions based on other pertinent skills or requirements assessed in work samples, interviews, or other subsequent screening tools, knowing that necessary cognitive skills levels have been met.

The Guttman-based scaling system is critical to this analysis. Because each level of skill is carefully defined and built upon less complex-lower skill levels in a stair-like manner, SMEs in the Work Keys job profiling procedure make direct comparisons between the content of the job and the content of each level of skill. Unlike Angoff analyses that require SMEs to judge percentages of employees or applicants likely to be successful on the job who can

pass individual test items, SMEs in the Work Keys system job profiling procedure make no percentage estimates. Rather, it evaluates and discusses whether employees need the level of skill as defined and described by two examples for each skill level to be effective on the job. The paired comparison judgements made by SMEs ("how does this description of the skill and the accompanying examples compare to that needed on your job; is it higher, lower, or about the same") are consistent with the ordinal scaling of the empirically tested skill levels of the tests.

Finally, this study addresses a popular misconception about validity and adverse impact of tests. Too often, tests are assumed either to have adverse impact or to not have adverse impact, as if adverse impact was a characteristic of a test. Work Keys data shows the issue to be far more complex. Critics of testing cannot simply demand tests without adverse impact as that, in all likelihood, technically impossible. However, as has been shown, valid tests of cognitive ability do not have to result in adverse impact where a lower level of the skill is sufficient.

This study concludes with one caveat: having a sufficient level of skill does not preclude the possibility that even higher levels of skill will result in even higher levels of performance. In fact, that is the standard conclusion reached from validity generalization studies of norm-referenced tests. What an employer has to decide is whether the incremental gain of higher levels of the tested skills will compensate for a smaller-sized applicant pool in which other skills may not be represented or which limit decisions related to other organizational needs.

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Table 1

Cumulative Percentage of Learners in State Passing at Each Level of Work Keys *Reading for Information* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=17,461)	AFRICAN AMERICAN (N=3,751)		HISPANIC (N=152)		ASIAN (N=148)	
	% PASS	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT
<3	100%	100%	-	100%	-	100%	-
3	95%	91%	No (.95)	86%	No (.90)	90%	No (.94)
4	88%	79%	No (.90)	76%	No (.86)	77%	No (.87)
5	59%	38%	Yes (.65)	46%	No* (.78)	49%	No (.83)
6	19%	8%	Yes (.42)	12%	Yes (.63)	18%	No (.94)
7	2%	<1%	Yes (.19)	3%	No (1.22)	1%	Yes (.63)

*This would meet 80% criterion with two more persons; therefore no adverse impact.

Table 1

Cumulative Percentage of Learners in State Passing at Each Level of Work Keys *Reading for Information* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=17,461)	HISPANIC (N=152)		ASIAN (N=148)	
	% PASS	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT
<3	100%	100%	-	100%	-
3	95%	86%	No (.90)	90%	No (.94)
4	88%	76%	No (.86)	77%	No (.87)
5	59%	46%	No[a] (.78)	49%	No (.83)
6	19%	12%	Yes (.63)	18%	No (.94)
7	2%	3%	No (1.22)	1%	Yes (.63)

[a]This would meet 80% criterion with two more persons; therefore no adverse impact.

Table 1

Cumulative Percentage of Learners in State Passing at Each Level of Work Keys *Reading for Information* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=17,461)	AFRICAN AMERICAN (N=3,751)	
	% PASS	% PASS	ADVERSE IMPACT
<3	100%	100%	-
3	95%	91%	No (.95)
4	88%	79%	No (.90)
5	59%	38%	Yes (.65)
6	19%	8%	Yes (.42)
7	2%	<1%	Yes (.19)

Table 2a

Cumulative Percentage of Learners in State Passing Each Level of Work Keys *Applied Mathematics* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

A: State One

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=17,461)	AFRICAN AMERICAN (N=3,751)		HISPANIC (N=152)		ASIAN (N=148)	
	% PASS	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT
<3	100%	100%	-	100%	-	100%	-
3	95%	87%	No (.92)	90%	No (.94)	89%	No (.99)
4	79%	52%	Yes (.66)	67%	No (.84)	72%	No (.92)
5	48%	21%	Yes (.43)	38%	No[a] (.79)	52%	No (1.09)
6	17%	3%	Yes (.20)	10%	Yes (.59)	18%	No (1.07)
7	4%	>1%	Yes (.10)	3%	Yes (.69)	7%	No (1.73)

Table 2b

B: State Two

LEVEL (SCORE)	WHITE\ CAUCASIAN (N=23,543)	AFRICAN AMERICAN (N=2,658)		HISPANIC (N=178)		ASIAN (N=148)	
	% PASS	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT
<3	100%	100%	-	100%	-	100%	-
3	90%	81%	No (.89)	83%	No (.92)	86%	No (.96)
4	72%	48%	Yes (.67)	56%	No[a] (.79)	67%	No (.94)
5	40%	19%	Yes (.47)	28%	Yes (.69)	41%	No (1.03)
6	11%	3%	Yes (.29)	7%	Yes (.61)	13%	No (1.17)
7	2%	<1%	Yes (.17)	<1%	Yes (.14)	4%	No (1.62)

[a]This would meet 80% criterion with two more persons; therefore no adverse impact.

Table 2a

Cumulative Percentage of Learners in State One Passing Each Level of Work Keys *Applied Mathematics* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

A: State One

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=17,461)	HISPANIC (N=152)		ASIAN (N=148)	
	% PASS	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT
<3	100%	100%	-	100%	-
3	95%	90%	No (.94)	89%	No (.99)
4	79%	67%	No (.84)	72%	No (.92)
5	48%	38%	No[a] (.79)	52%	No (1.09)
6	17%	10%	Yes (.59)	18%	No (1.07)
7	4%	3%	Yes (.69)	7%	No (1.73)

[a]This would meet 80% criterion with two more persons; therefore no adverse impact.

Table 2a

Cumulative Percentage of Learners in State One Passing Each Level of Work Keys *Applied Mathematics* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

A: State One

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=17,461)	AFRICAN AMERICAN (N=3,751)	
	% PASS	% PASS	ADVERSE IMPACT
<3	100%	100%	-
3	95%	87%	No (.92)
4	79%	52%	Yes (.66)
5	48%	21%	Yes (.43)
6	17%	3%	Yes (.20)
7	4%	>1%	Yes (.10)

Table 2b

Cumulative Percentage of Learners in State Two Passing Each Level of Work Keys *Applied Mathematics* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

B: State Two

LEVEL (SCORE)	WHITE\ CAUCASIAN (N=23,543)	HISPANIC (N=552)		ASIAN (N=178)	
	% PASS	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT
<3	100%	100%	-	100%	-
3	90%	83%	No (.92)	86%	No (.96)
4	72%	56%	No[a] (.79)	67%	No (.94)
5	40%	28%	Yes (.69)	41%	No (1.03)
6	11%	7%	Yes (.61)	13%	No (1.17)
7	2%	<1%	Yes (.14)	4%	No (1.62)

[a]This would meet 80% criterion with two more persons; therefore no adverse impact.

Table 2b

Cumulative Percentage of Learners in State Two Passing Each Level of Work Keys *Applied Mathematics* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

B: State Two

LEVEL (SCORE)	WHITE\ CAUCASIAN (N=23,543)	AFRICAN AMERICAN (N=2,658)	
	% PASS	% PASS	ADVERSE IMPACT
<3	100%	100%	-
3	90%	81%	No (.89)
4	72%	48%	Yes (.67)
5	40%	19%	Yes (.47)
6	11%	3%	Yes (.29)
7	2%	<1%	Yes (.17)

Table 3

Cumulative Percentage of Learners in State Two Passing at Each Level of Work Keys *Locating Information* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=28,466)	AFRICAN AMERICAN (N=2,679)		HISPANIC (N=676)		ASIAN (N=167)	
	% PASS	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT
<3	100%	100%	-	100%	-	100%	-
3	88%	81%	No (.92)	81%	No (.93)	83%	No (.95)
4	70%	57%	No (.81)	60%	No (.86)	58%	No (.83)
5	23%	12%	Yes (.51)	16%	Yes (.70)	23%	No (1.01)
6	1%	<1%	Yes (.20)	<1%	Yes (.22)	2%	No (1.41)

Table 3

Cumulative Percentage of Learners in State Two Passing at Each Level of Work Keys *Locating Information* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=28,466)	HISPANIC (N=676)		ASIAN (N=167)	
	% PASS	% PASS	ADVERSE IMPACT	% PASS	ADVERSE IMPACT
<3	100%	100%	-	100%	-
3	88%	81%	No (.93)	83%	No (.95)
4	70%	60%	No (.86)	58%	No (.83)
5	23%	16%	Yes (.70)	23%	No (1.01)
6	1%	<1%	Yes (.22)	2%	No (1.41)

Table 3

Cumulative Percentage of Learners in State 2 Passing at Each Level of Work Keys *Locating Information* Test for Race/Ethnic Groups and for Adverse Impact Analysis (Yes/No) Using 80% Rule

LEVEL (SCORE)	WHITE/ CAUCASIAN (N=28,466)	AFRICAN AMERICAN (N=2,679)	
	% PASS	% PASS	ADVERSE IMPACT
<3	100%	100%	-
3	88%	81%	No (.92)
4	70%	57%	No (.81)
5	23%	12%	Yes (.51)
6	1%	<1%	Yes (.20)

TABLE 4a

Skills Profiles and Estimated Adverse Impact for NC Machine Operator and Production Assembler Jobs

	Reading for Information (3-7)		Applied Mathematics (3-7)		Locating Information (3-6)	
	Mdn	Range	Mdn	Range	Mdn	Range
Production Assembler 4 Profiles	3	{3-4}	3	{<3-4}	3	{3}
Adverse Impact						
African-American	.92 (No)		.92/.89 (No)		.95 (No)	
Hispanic	.93 (No)		.84/.79 (No)		.90 (No)	
Asian	.95 (No)		.99/.95 (No)		.94 (No)	

	Reading for Information (3-7)		Applied Mathematics (3-7)		Locating Information (3-6)	
	Mdn	Range	Mdn	Range	Mdn	Range
NC Machine Operator 8 Profiles	5	{4-6}	6	{5-7}	5	{4-6}
Adverse Impact						
African-American	.65 (Yes)		.20/.29 (Yes)		.51 (Yes)	
Hispanic	.78 (No)		.59/.61 (Yes)		.70 (No)	
Asian	.83 (No)		1.07 /1.17 (No)		1.01 (No)	

TABLE 4b

Skills Profiles and Estimated Adverse Impact for Shipping Clerk and Secretary Jobs

	Reading for Information (3-7)		Applied Mathematics (3-7)		Locating Information (3-6)	
	Mdn	Range	Mdn	Range	Mdn	Range
Shipping Clerk 9 Profiles	4	{N-6}	3	{3-5}	4	{3-5}
Adverse Impact						
African-American	.90 (No)		.92/.89 (No)		.81 (No)	
Hispanic	.86 (No)		.94/.92 (No)		.86 (No)	
Asian	.87 (No)		.99/.96 (No)		.83 (No)	

	Reading for Information (3-7)		Applied Mathematics (3-7)		Locating Information (3-6)	
	Mdn	Range	Mdn	Range	Mdn	Range
Secretary 13 Profiles	5	{3-7}	5	{N-6}	4	{N-5}
Adverse Impact						
African-American	.65 (Yes)		.43/.47 (Yes)		.81 (No)	
Hispanic	.78 (No)		.79/.69 (No)		.86 (No)	
Asian	.83 (No)		1.09/1.03 (No)		.83 (No)	